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Nanostructured europium oxide thin films deposited by pulsed laser ablation of a metallic target in a He buffer atmosphere

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Nanostrucured europium oxide and hydroxide films were obtained by pulsed Nd:YAG (532 nm) laser ablation of a europium metallic target, in the presence of a 1 mbar helium buffer atmosphere. Both the produced film and the ambient plasma were characterized. The plasma was monitored by an electrostatic probe, for plume expansion in vacuum or in the presence of the buffer atmosphere. The time evolution of the ion saturation current was obtained for several probe to substrate distances. The results show the splitting of the plume into two velocity groups, being the lower velocity profile associated with metal cluster formation within the plume. The films were obtained in the presence of helium atmosphere, for several target-to-substrate distances. They were analyzed by Rutherford backscattering spectrometry, x-ray diffraction, and atomic force microscopy, for as-deposited and $600\ ^{\circ}\mathrm{C}$ treated-in-air samples. The results show that the as-deposited samples are amorphous and have chemical composition compatible with europium oxide, x-ray diffraction showing excess oxygen. Film nanostructuring was shown to be strongly correlated with cluster formation, as shown by velocity splitting in probe current versus time plots.

Topics

Electrostatics, **Laser ablation**, **Atomic force microscopy**, **Thin films**, **X-ray diffraction**, **Nanoparticle**, **Nanotubes**, **Oxides**, **Plasma sources**

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